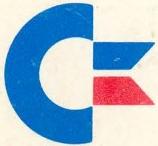


SERVICE MANUAL

1930
VGA COLOR MONITOR

AUGUST, 1990

PN-314255-01

 **Commodore**

Produced By:

**Commodore International Spare Parts GmbH
Braunschweig, West Germany**

SERVICE MANUAL

**1930
VGA COLOR MONITOR**

AUGUST, 1990

PN-314255-01

INTERNATIONAL EDITION

COMMODORE "INTERNATIONAL EDITION" SERVICE MANUALS CONTAIN PART NUMBER INFORMATION WHICH MAY VARY ACCORDING TO COUNTRY. SOME PARTS MAY NOT BE AVAILABLE IN ALL COUNTRIES.

Commodore Business Machines, Inc.

1200 Wilson Drive, West Chester, Pennsylvania 19380 U.S.A.

Commodore makes no express or implied warranties with regard to the information contained herein. The information is made available solely on an as is basis, and the entire risk as to completeness, reliability, and accuracy is with the user. Commodore shall not be liable for any damages in connection with the use of the information contained herein. The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty as to quality or suitability of such replacement part. Reproduction or use without express permission, of editorial or pictorial content, in any matter is prohibited.

This manual contains copyrighted and proprietary information. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written permission of Commodore Electronics Limited.

IMPORTANT SAFETY NOTICE

Proper service and repair is important to the safe, reliable operation of all NAPCEC Equipment. The service procedures recommended by NAPCEC and described in this service manual are effective methods of performing service operations. Some of these service operations require the use of tools specially designed for the purpose. The special tools should be used when and as recommended.

It is important to note that this manual contains various CAUTIONS and NOTICES which should be carefully read in order to minimize the risk of personal injury to service personnel. The possibility exists that improper service methods may damage the equipment. It also is important to understand that these CAUTIONS and NOTICES ARE NOT EXHAUSTIVE. NAPCEC could not possibly know, evaluate and advise the service trade of all conceivable ways in which service might be done or of the possible hazardous consequences of each way. Consequently, NAPCEC has not undertaken any such broad evaluation. Accordingly, a servicer who uses a service procedure or tool which is not recommended by NAPCEC must first satisfy himself thoroughly that neither his safety nor the safe operation of the equipment will be jeopardized by the service method selected.

WARNING

Critical components having special safety characteristics are identified with an S by the Ref. No. in the parts list and enclosed within a broken line* along with the safety symbol on the schematics or exploded views.

Use of substitute replacement parts which do not have the same specified safety characteristics may create shock, fire, or other hazards.

Under no circumstances should the original design be modified or altered without written permission from the N.A.P. Consumer Electronics Corp. NAPCEC assumes no liability, express or implied, arising out of any unauthorized modification of design. Servicer assumes all liability.

* Broken line: — · — · — · — ·

TABLE OF CONTENTS

TITLE	PAGE
SAFETY PRECAUTIONS	1
GENERAL	1
SPECIFICATIONS	2
CONTROLS	2
MECHANICAL REPLACEMENT PARTS LIST	3
CUSTOMER ADJUSTMENTS	3
ADJUSTMENT PROCEDURES	5
INTERCONNECT WIRING DIAGRAM (EXPLODED VIEW)	8
SCHEMATIC NOTES	9
CHASSIS REMOVAL	9
WAVEFORMS	10
SCHEMATIC DIAGRAM (MAIN & CRT SOCKET PANELS)	10
SCHEMATIC DIAGRAM (POWER SUPPLY)	11
P.C. BOARD (MAIN PANEL)	12
P.C. BOARD (CRT SOCKET PANEL)	13
P.C. BOARD (POWER SUPPLY PANEL)	14
REPLACEMENT PARTS LIST	15
SAFETY GUIDELINES	21
SCHEMATIC DIAGRAM (1930-B — CBM CASE COLOR MONITOR)	23

SAFETY NOTICE

ANY PERSON ATTEMPTING TO SERVICE THIS CHASSIS MUST FAMILIARIZE HIMSELF WITH THE CHASSIS AND BE AWARE OF THE NECESSARY SAFETY PRECAUTIONS TO BE USED WHEN SERVICING ELECTRONIC EQUIPMENT CONTAINING HIGH VOLTAGES.

CAUTION

USE A SEPARATE ISOLATION TRANSFORMER FOR THIS UNIT WHEN SERVICING.

SAFETY PRECAUTIONS

Picture Tube Replacement

The primary source of X-radiation in this monitor is the picture tube. The picture tube utilized in this chassis is specially constructed to limit X-radiation emissions. For continued X-radiation protection, the replacement tube must be the same type as the original, including suffix letter, or N.A.P. Consumer Electronics corp. (NAPCEC) approved type.

Safety goggles must be worn when the picture tube is replaced.

Parts Replacement

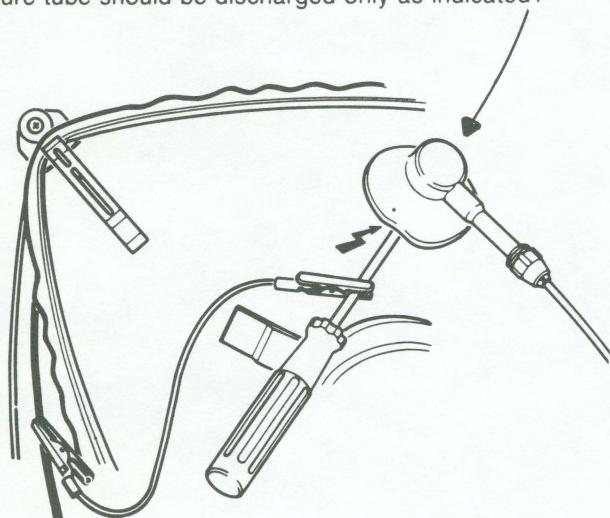
Many electrical and mechanical parts in NAPCEC monitors have special safety-related characteristics. These characteristics are often not evident from visual inspection nor can the protection afforded by them necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. The use of a substitute part which does not have the same safety characteristics as the NAPCEC recommended replacement parts shown in this service manual may create shock, fire or other hazards.

GENERAL



All ICs and many other semi-conductors are susceptible to electrostatic discharges (ESD). Careless handling during repair can reduce life drastically. When repairing, make sure that you are connected to the same potential as the mass of the set via a wrist wrap with resistance. Keep components and tools also at this potential.

To prevent ICs and transistors from being damaged, highvoltage flash-overs should be avoided. For checking the high voltage, a suitable meter should be used. The picture tube should be discharged only as indicated.



Be careful when measuring the EHT-section and the picture tube.

Use plastic instead of metal tools for adjusting. This is necessary to avoid a short-circuit or to avoid causing a circuit to become unstable.

Never replace components when the set is switched on.

Removing the chassis

- Remove the backcover
- Slide out the chassis
- After repair the connecting cables of the chassis should be fixed in the original way.

SPECIFICATIONS

(subject to modification)

AC voltage	- 120Vac +/- 10% - 60Hz
Power consumption at 120V	- 85 Watts
EHT	- 24 KV
Line frequency	- 31480 Hz
Frame frequency	- 60 Hz/70 Hz
Band width	- 18 MHz
Picture tube (9CM082)	- M34 JPS 77 X 69
Picture tube (9CM062)	- M34 JPM 70X69

RESOLUTION

Sync. polarity	- pos/neg
HOR. VERT.	
Pos. Neg.	- 640 dots X 350 lines
Neg. Pos.	- 640 dots X 400 lines
Neg.	- 640 dots X 480 lines

INPUT SPECS

RGB linear	- all colors
Sync TTL level	- pos/neg

CONTROLS

Front	: Power on/off SK1 (incl. LED indicator) : Brightness (R558) : Contrast (R322) : Horizontal phase (centering) (R408) : Vertical centering (R524)
Rear	: Horizontal width (R541) : Vertical height (R513 for 480 lines)

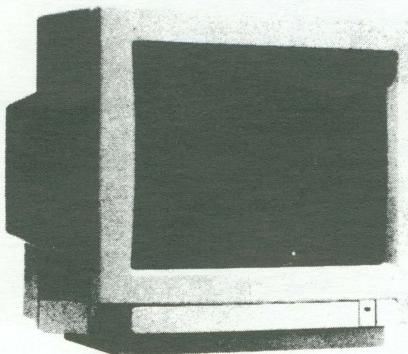
INPUT SIGNAL CONNECTOR
 15 PIN "D" SHELL CONNECTOR

1 - red	6 - red ground	11 - ground
2 - green	7 - green ground	12 - n.c.
3 - blue	8 - blue ground	13 - horizontal sync
4 - n.c.	9 - n.c.	14 - vertical sync
5 - self test	10 - ground	15 - n.c.

VGA STANDARD

Horizontal frequency	Vertical frequency	H. Sync. polarity	V. Sync. polarity	Resolution (horizontal lines)
31.5 kHz	70 kHz	Positive (+)	Negative (-)	350
31.5 kHz	70 kHz	Negative (-)	Positive (+)	400
31.5 kHz	60 kHz	Negative (-)	Negative (-)	480

MECHANICAL/ELECTRICAL PARTS

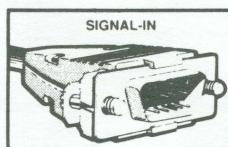


Ref.	Description	Part. No.
	Front Cabinet	1492150171
	Rear Cabinet	1492160058
	Push Button On/Off	1494200366
	Cover for Controls	1491320305
	Pad (Table Protectors)	4495200003
	Lock for Cover	1491410003
	Adjust Rod	1191000039
	Slider Chassis	1493030033
	Pedestal	1491080019
	Holder Line Input Transformer	1491070126
S	Mains Cord	4692020069
S	Picture Tube (9CM082)	M34JPS77X69
S	Picture Tube (9CM062)	M34JPM70X69
	Customer Inst. Book (9CM082)	IB53790001
	Customer Inst. Book (9CM062)	IB55180001
	Foot Pedestal (9CM082)	1491080019
	Foot Pedestal (9CM062)	1491030024
	Degaussing Coil	3691300012

CUSTOMER ADJUSTMENT

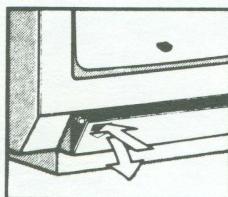
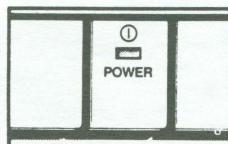
1. Connection

Connecting the monitor to the computer. The monitor is fitted with a 15-pin D-shell connector.



2. Adjustments and controls

a. Power on/off switch SK 1 (LED lights up)



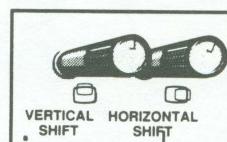
b. Contrast can be adjusted with control (R322)

c. Brightness can be adjusted with control (R558)



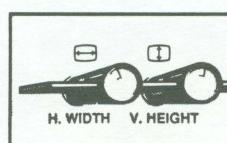
d. The image may be positioned horizontally with control (R408)

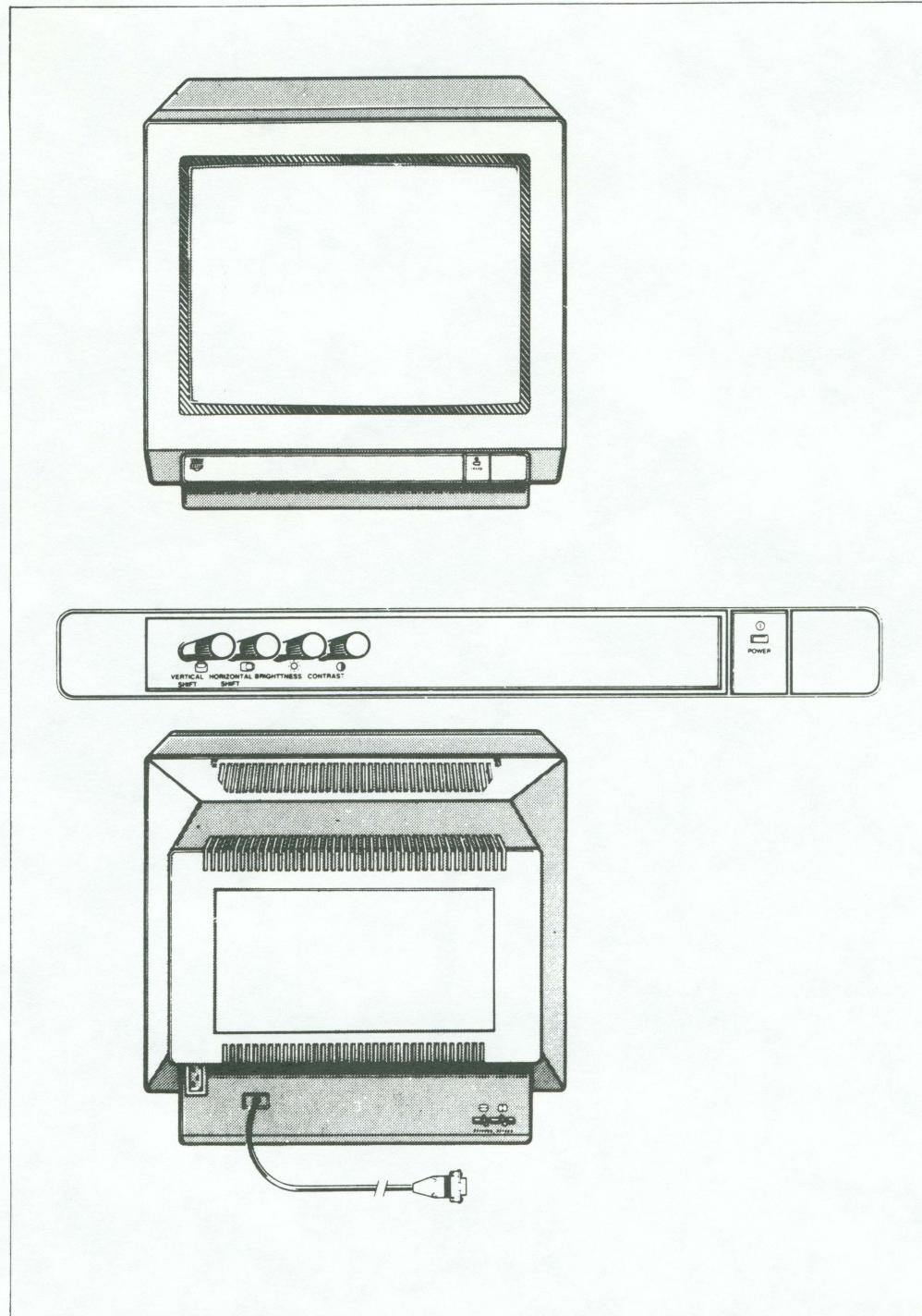
e. The image may be positioned vertically with control (R524)



f. You can adjust the image height with control (R513 for 480 lines)

g. The image width can be adjusted with control (R541)





SERVICE ADJUSTMENTS

Adjustment notes:

Caution

1. Use an isolation transformer when applying power to the exposed chassis.
2. Line voltage maintained at 120V AC, 60Hz.
3. The unit should be allowed to warm up for at least 30 minutes prior to making any adjustments.
4. Voltages measured with respect to ground.

Adjustments

1. +120 Vdc supply voltage

- Contrast and brightness to minimum.
- Connect a voltmeter across C145 and turn on the monitor.
- Adjust R114 for a reading of 120V on the meter.

2. Synchronization

Horizontal synchronization

- Inject a cross-hatch pattern and short R413/C415.
- Adjust R419 until the picture is straight.
- Remove the short-circuit

Vertical synchronization

- Turn off the vertical sync. by removing input signal.
- Adjust R504 for 47 Hz at pin 3 of IC501

3. Focus

Adjust the focus control for optimal focus.

4. Adjustment of picture geometry

- Inject a cross-hatch pattern and set brightness and contrast to the mechanical mid-position.

East-West correction

- Adjust R539 so that the vertical lines at the left-hand and the right-hand side are straight (480 lines).

Vertical linearity

- Adjust R516 so that a good linearity is obtained between upper and lower side of the picture (480 lines).

Horizontal amplitude

- Set the horizontal width to 240 mm with R541 (480 lines).

Horizontal position

- The horizontal centering can be adjusted with R441.
- Adjust R411 so that R408 allows as much shifting to the left as to the right (480 lines).

Vertical amplitude

- Adjust the vertical height to 180 mm with R513 (480 lines) (R507 for 400 lines and R509 for 350 lines).
- The vertical centering can be adjusted with R524.

Brightness presetting

- Set brightness to mechanical mid-position.
- Adjust R567 so that the voltage across C555 is -41V

5. VG2 adjustment and cut-off points in picture tube

- Adjust brightness to mechanical mid-position and adjust contrast to maximum.
- Adjust VG2 (SCREEN) to minimum.
- Adjust R726, R733 and R739 to mechanical mid-position.
- Inject a white pattern signal and adjust VG2 (SCREEN) until one color becomes visible.
- Set the pattern generator to purity with the color that was first visible.
- Readjust VG2 to just visible light.
- Adjust the 2 remaining colors with their corresponding purity color for the same light output using potentiometers R726, R733 or R739.
- Now return to white pattern signal and adjust potentiometers R726, R733 and R739 until an optimum background color is formed.
- Using potentiometers R328, R332 and R335 (with white pattern signal), adjust the background color so that at minimum brightness and maximum brightness the background color is the same.

SERVICE ADJUSTMENTS (Continued)

Note: The following adjustments need only be performed if the CRT has been replaced. Minor corrections for purity and convergence may be accomplished through the use of the Purity and Convergence Assembly located on the neck of the CRT.

Color Purity adjustment (Refer to Figure 1)

1. Loosen the yoke clamp screw and slide the yoke back away from the rubber wedges.
2. Remove the rubber wedges (G) and slide the yoke forward until it rests firmly against the bell of the CRT.
3. Tighten the yoke clamp screw slightly so that the yoke can still be moved with some friction.
4. Place the multi-pole Purity and Convergence Assembly in the position shown in Figure 1.
5. Tighten screw (A) and turn securing ring (B) counterclockwise. Position the unit so that it faces in an East/West direction and degauss the instrument.

6. Turn on the power and inject a cross-hatch pattern signal. Allow a 10 minute warm-up period.
7. Roughly adjust the static convergence, using tabs C and D.
8. Set the Vertical Centering Control (R524) to its mechanical center. Disconnect R728 and R735 to turn off the green and blue guns.
9. Adjust the Two-pole purity rings (E) to center the red vertical and horizontal lines.
10. Inject a white pattern signal and move the deflection yoke to obtain a full red raster.
11. Turn on the green and blue guns by reconnecting R728 and R735. If a uniformly white raster does not appear, minor adjustments may be made by adjusting the purity rings (E).
12. Inject a cross-hatch pattern signal to ensure that the yoke is not tilted. If necessary rotate the yoke to obtain a level raster.
13. Tighten screw F and adjust R524 for proper vertical centering. Proceed to the Static Convergence Adjustment.

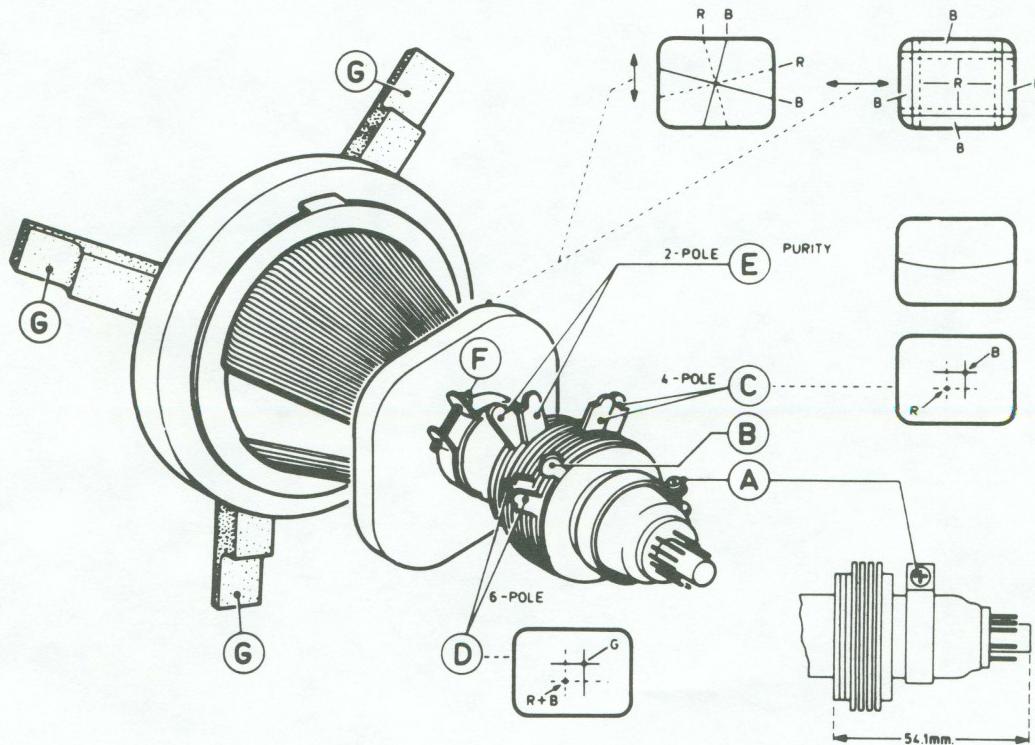


Fig. 1

SERVICE ADJUSTMENTS (Continued)

Static Convergence Adjustment

1. Inject a cross-hatch pattern signal and allow a 10 minute warm-up period.
2. Turn off the green gun by disconnecting R728. Turn locking ring (B) counterclockwise.
3. Slowly spread, and if necessary, rotate the 4-pole magnetic rings (C) to converge red and blue lines at the center of the screen.
4. Reconnect R728 to turn on the green gun and disconnect R735 to turn off the blue gun.
5. Slowly spread, and if necessary, rotate the 6-pole magnetic rings (D) to converge the red and green lines at the center of the screen.
6. Reconnect R735 to turn on the blue gun.
7. For optimum performance, repeat steps 1 through 6. Proceed to the Dynamic Convergence Adjustment.

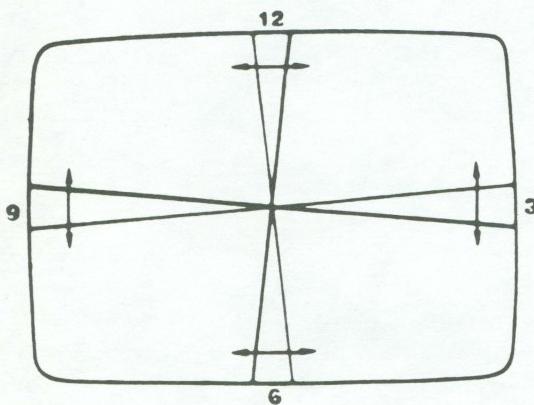


Figure 2 - Tilt yoke up or down to converge Red and Blue vertical lines at 6 and 12 o'clock positions, and Red and Blue horizontal lines at 3 and 9 o'clock positions.

Dynamic Convergence Adjustment

1. Inject a cross-hatch pattern signal and turn off the green gun by disconnecting R728.
2. Tilt the yoke up and down to achieve the best convergence of the red and blue vertical lines at the 6 and 12 o'clock and the red and blue horizontal lines at the 3 and 9 o'clock positions (see Figure 2).
3. When the correct position has been found, place a rubber wedge between the yoke and CRT. If the yoke is tilted up, place wedge 1 as shown in Figure 3a; if it is tilted down, place wedge 1 as shown in Figure 4a.
4. Tilt the yoke to the left and right to find the point of best possible convergence of the red and blue lines at the edges, top, and bottom of the screen as shown in Figure 5.
5. When the correct position is located, place wedges 2 and 3 as shown in Figure 3b or 4b.
6. Remove wedge 1 and place it in the final position as shown in Figure 3c or 4c. Reconnect resistor R728 to turn on the green gun.



Figure 3a

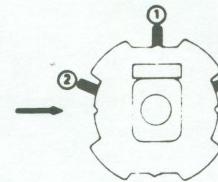


Figure 3b

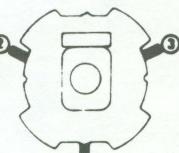


Figure 3c



Figure 4a

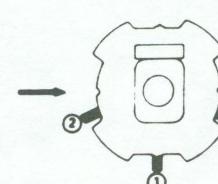


Figure 4b

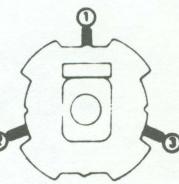


Figure 4c

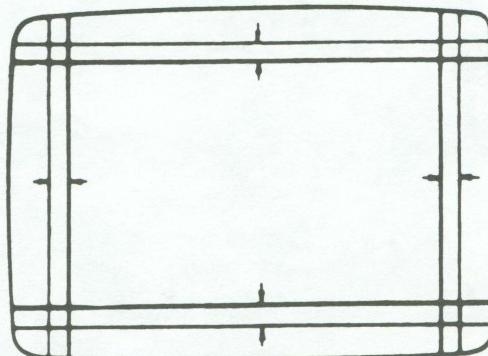
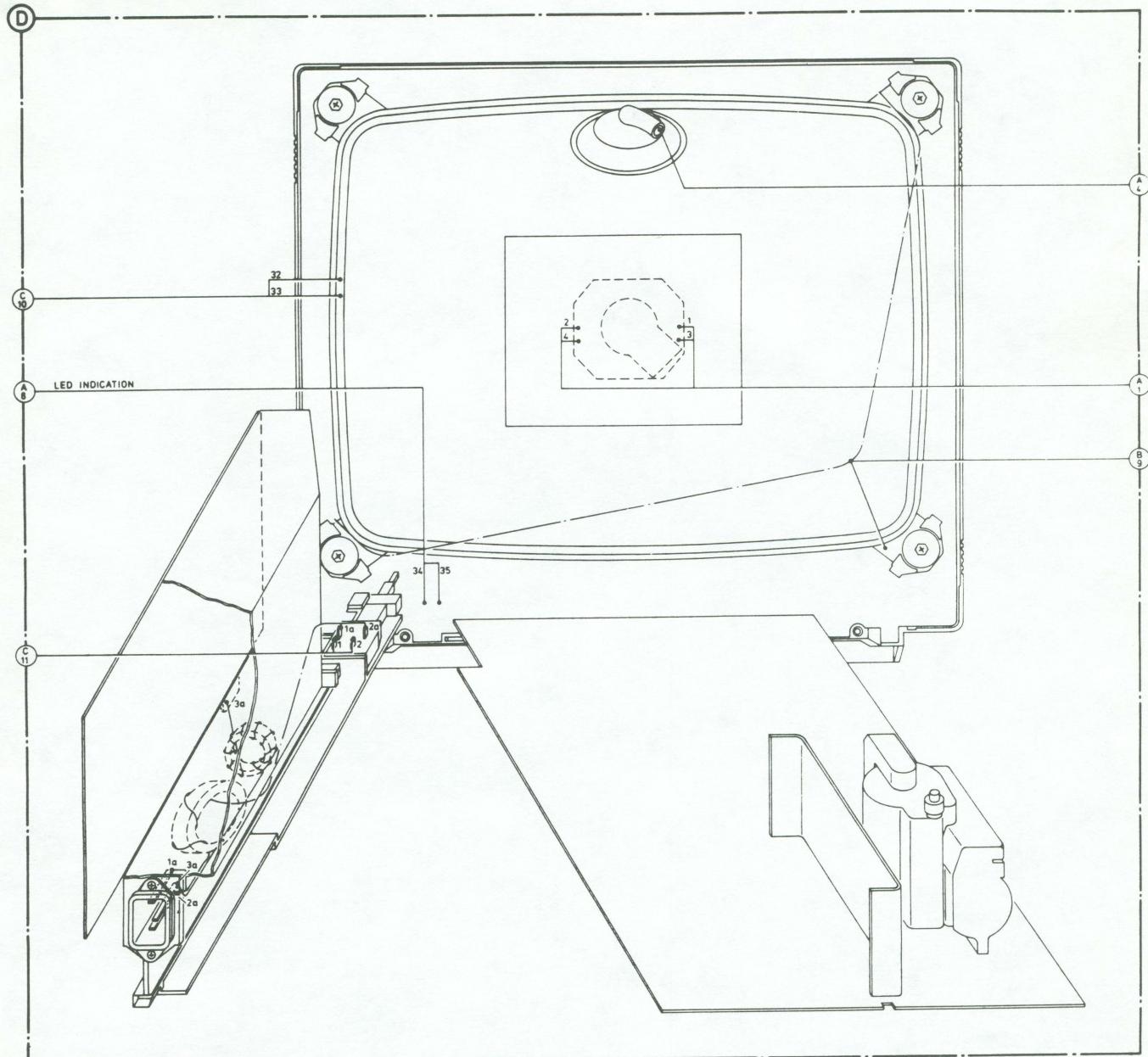


Figure 5 - Tilt yoke left to right to converge Red and Blue horizontal lines at the 6 and 12 positions, and Red and Blue vertical lines at 3 and 9 o'clock positions.

INTERCONNECT WIRING DIAGRAM



SCHEMATIC NOTES

1. DC voltages and waveforms should be measured with respect to ground as close as possible to the point to be measured.
2. All voltages are positive DC with respect to ground, be it the isolated ground (ground ) or the AC ground (ground ) and may vary due to normal production tolerances. Voltage sources are also nominal, with the exception of the 120Vdc source which is set at the factory to be +/- 1Vdc.
3. DC voltages and waveforms without brackets were measured under the following conditions:
 - A. Line voltage maintained at 120 Vac, 60Hz via an isolation transformer.
 - B. Contrast and brightness set at the mechanical mid-position (detent).
 - C. Using a color bar pattern from an RGB pattern generator (Network Technologies lncorporated Montest-A5D3 or equivalent). On a scan format of 31.5kHz./480 line resolution.
4. DC voltages with brackets and waveforms with the suffix (A) and in a box were taken in the self test mode and in the same conditions as in steps 3A and 3B.
5. For voltage, wattage or tolerance ratings of capacitors or resistors, refer to the electrical replacement parts list.
6. The CRT board is provided with printed spark gaps. Each spark gap is arranged between an electrode of the CRT and the aquadag coating.
7. During manufacture alternative semiconductors may be used. However the semiconductors specified in the parts list and circuit diagram can always be used as replacements.
8. Capacitance values are listed in microfarads (μ), nanofarads (n) and picofarads (p). $(0.001\mu=1\mu=1000p)$
9. * = indicates component raised 1/4 inch above the P.C. Board.

CHASSIS REMOVAL

With the back removed, all power disconnected and looking from the back.

1. Remove the bottom left CRT Screw with the Ground wire.
2. Remove the screw at the top of the Power Supply Panel with the ground wire.
3. Remove the screw above the AC power input plug.
4. Remove all cable and wire tie downs.
5. Unplug M102 and M110 from the Main Chassis.

6. Turn the back to the left. Start at the AC input plug and look to the right. Remove the first screw in the support bracket.
7. Now lift and pull the Main Chassis and the Power supply to the rear. Lay the Power supply to the left.
8. Remove the chassis rails and replug M102 to the Main Chassis.
To replace the the Main Chassis and Power Supply do the steps in reverse order.

CAUTION

USE A SEPARATE ISOLATION TRANSFORMER FOR THIS UNIT WHEN SERVICING.

WARNING

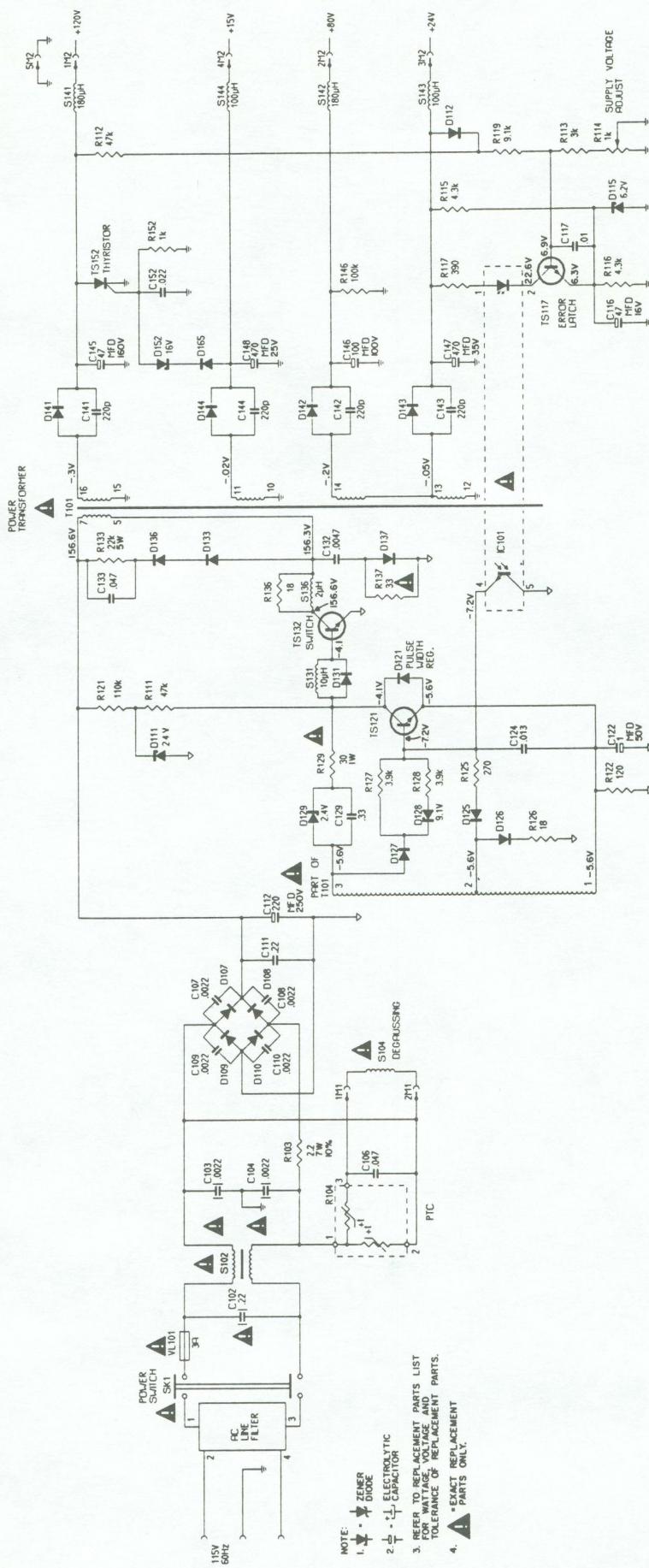
Critical components having special safety characteristics are identified with an S by the Ref. No. in the parts list and enclosed within a broken line* along with the safety symbol  on the schematics or exploded views.

Use of substitute replacement parts which do not have the same specified safety characteristics may create shock, fire, or other hazards.

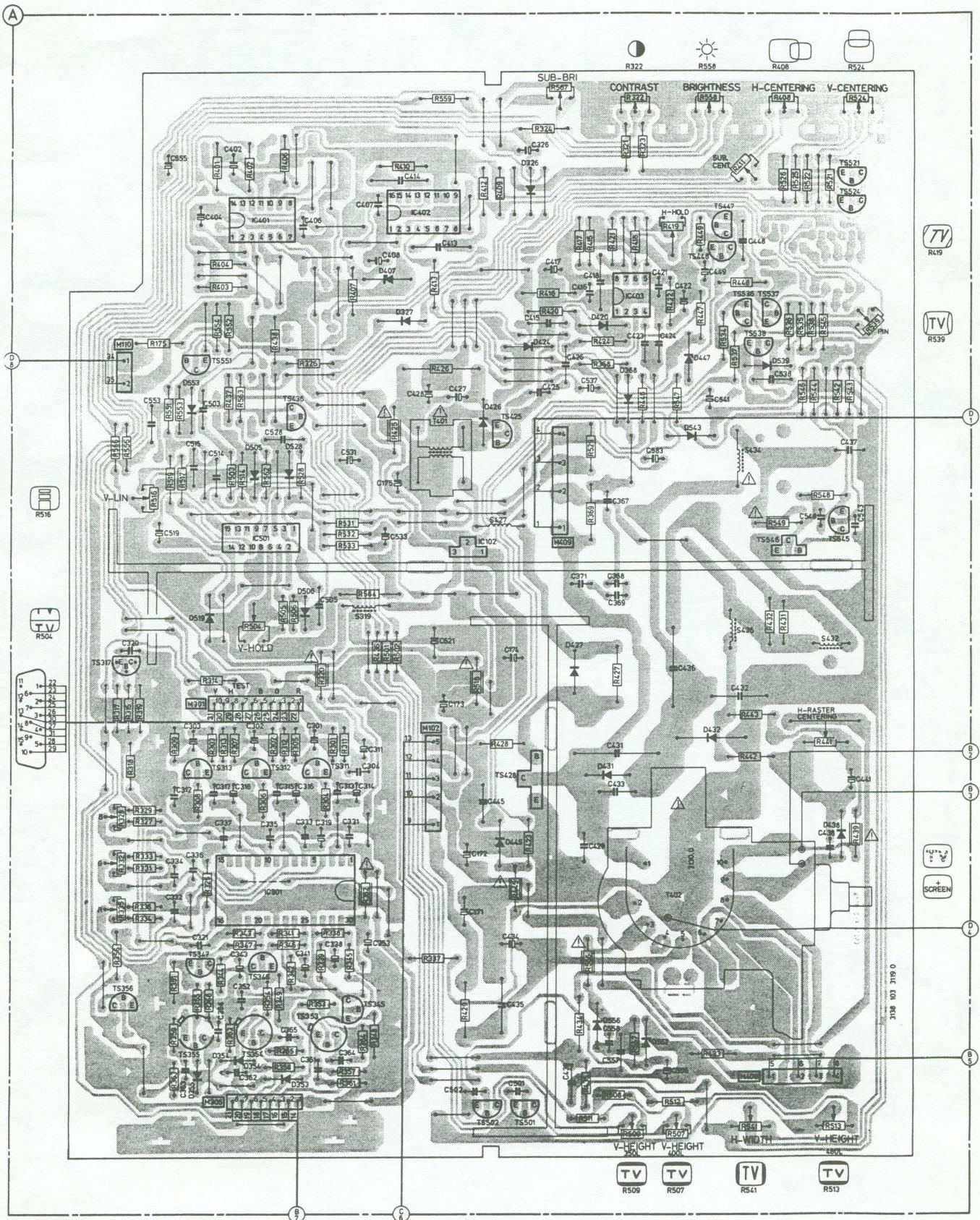
Under no circumstances should the original design be modified or altered without written permission from the N.A.P. Consumer Electronics Corp. NAPCEC assumes no liability, express or implied, arising out of any unauthorized modification of design. Servicer assumes all liability.

*Broken line: _____

POWER SUPPLY SCHEMATIC DIAGRAM

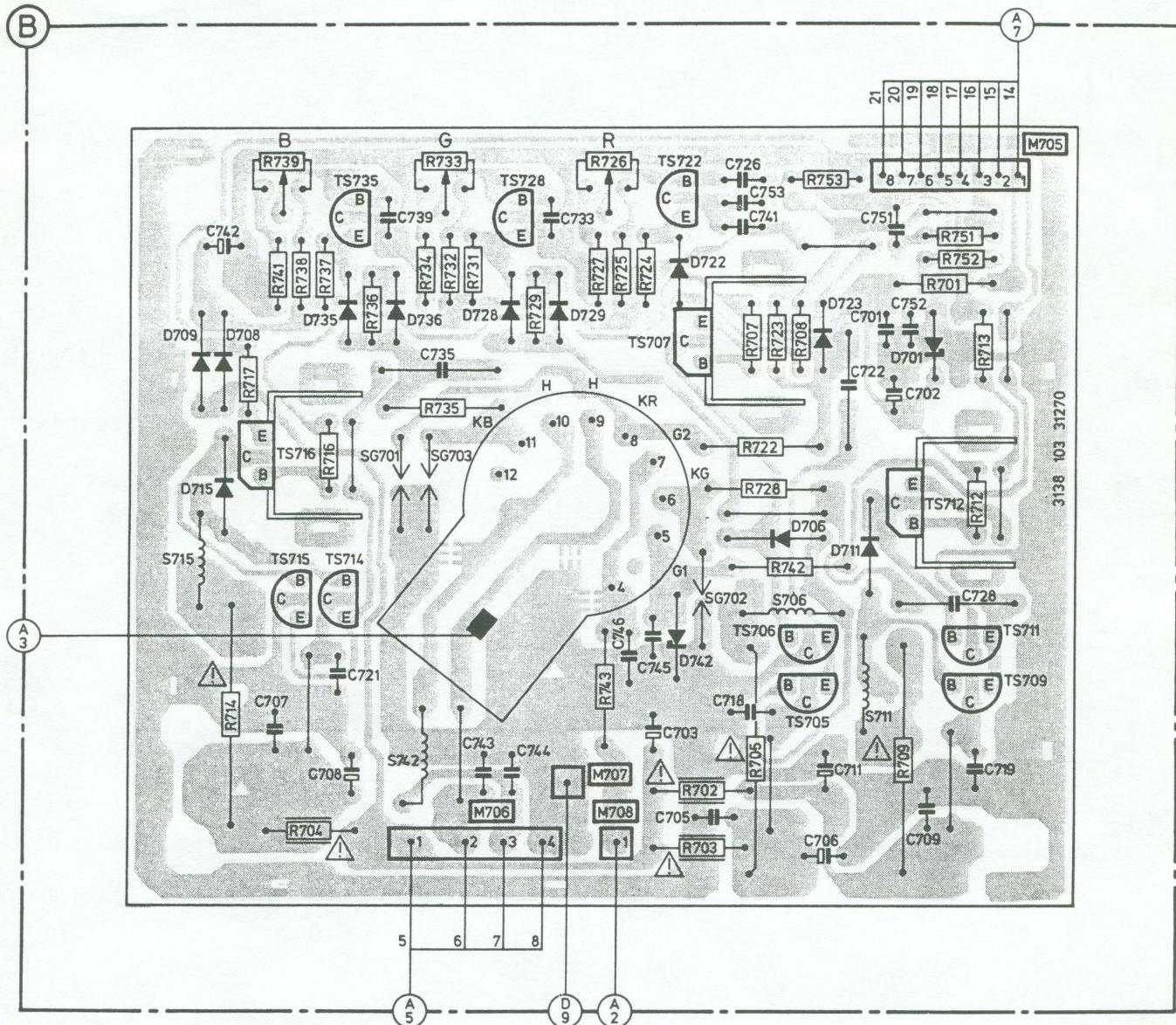


MAIN P.C. BOARD



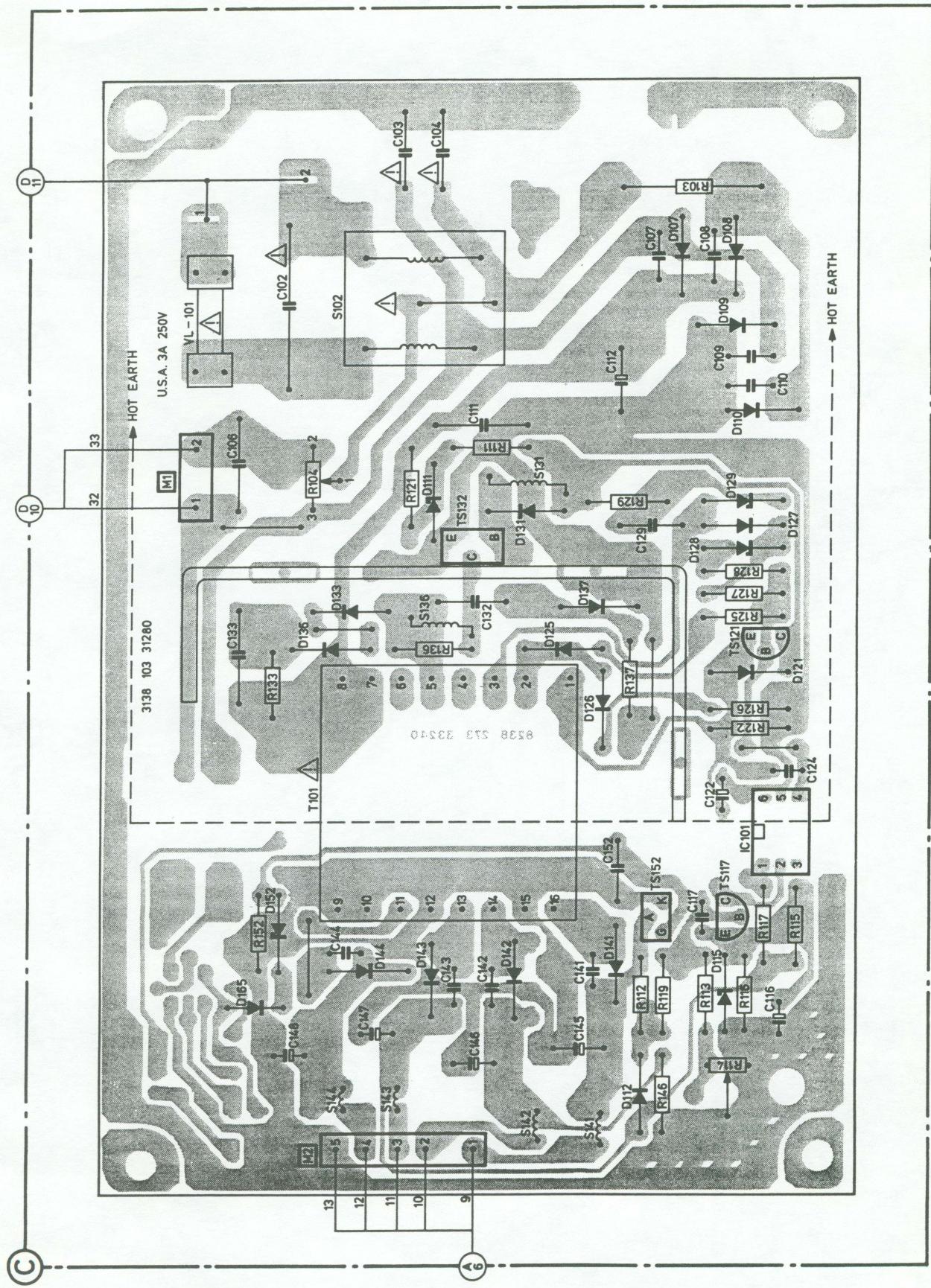
PICTURE TUBE P.C. BOARD

(viewed from the component side)



POWER SUPPLY P.C. BOARD

(viewed from the component side)



9CM062/9CM082 REPLACEMENT PARTS LIST

To ensure optimum performance and reliability always use
genuine factory replacement parts.

PART OF LED ASSY

Ref.	Description	Part. No.
D175	Connector 2 pole LED green	4613990296 5392100470

C371 5.1pF, 10%, 500V, ceramic 2509041403

C402 10µF, 16V, electrolytic 2701741028

C404 10µF, 16V, electrolytic 2701741028

C406 0.010µF, 10%, 50V, ceramic 2508331038

C407 0.022µF, 20%, 50V, ceramic 2508332238

C408 100µF, 16V, electrolytic 2701741029

C413 0.0027µF, 10%, 50V, polyester 2509041381

C414 0.0027µF, 10%, 50V, polyester 2509041381

C415 0.010µF, 10%, 100V, polyester 2509041054

C416 0.010µF, 10%, 50V, ceramic 2508331038

C417 100µF, 16V, electrolytic 2701741029

C418 0.0033µF, 5%, 50V, polyester 2602320842

C421 0.0047µF, 20%, 50V, ceramic 2508304728

C422 1µF, 50V, electrolytic 2701741015

C423 0.1µF, 10%, 100V, polyester 2508141049

C424 0.010µF, 20%, 400V, polyester 2509581039

C425 27pF, 5%, 500V, ceramic 2509040814

C426 0.22µF, 10%, 100V, polyester 2508142249

C427 2.2µF, 63V, electrolytic 2791202297

C428 22µF, 35V, electrolytic 2701741099

C429 100pF, 10%, 2KV, ceramic 2509041404

C431 0.0039µF, 5%, 1.6KV, polyester 2602320837

C432 0.013µF, 5%, 400V, polyester 2509040290

C433 220pF, 10%, 2KV, ceramic 2602320844

C434 10µF, 160V, electrolytic 2796331000

C435 0.22µF, 10%, 250V, polyester 2602320543

C436 0.56µF, 10%, 250V, polyester 2596135649

C437 6.8µF, 50V, bi-polar 2701741027

C438 470pF, 10%, 500V, ceramic 2602320845

C439 0.047µF, 10%, 250V, polyester 2508154739

C441 220µF, 16V, electrolytic 2701741017

C445 0.010µF, 20%, 400V, polyester 2509581039

C448 0.047µF, 10%, 250V, polyester 2508154739

C449 1µF, 50V, electrolytic 2701741015

C501 0.001µF, 10%, 50V, ceramic 2508281029

C502 0.001µF, 10%, 50V, ceramic 2508281029

C503 0.010µF, 10%, 100V, polyester 2509041054

C505 0.33µF, 10%, 63V, polyester 2508143349

C514 0.10µF, 10%, 100V, polyester 2508141049

C515 0.10µF, 10%, 100V, polyester 2508141049

C519 220µF, 35V, electrolytic 2602320854

C521 1000µF, 35V, electrolytic 2701741022

C528 0.22µF, 10%, 100V, polyester 2508142249

C531 2200µF, 16V, electrolytic 2701741030

C533 47µF, 16V, electrolytic 2701741016

C537 100µF, 16V, electrolytic 2701741029

C538 0.33µF, 10%, 63V, polyester 2508143349

C541 100µF, 35V, electrolytic 2509041326

C543 0.0033µF, 10%, 50V, ceramic 2602320850

C548 100pF, 10%, 50V, ceramic 2508311019

C553 0.22µF, 10%, 100V, polyester 2508142249

C555 1µF, 160V, electrolytic 2701741021

C556 10µF, 160V, electrolytic 2796331000

C557 0.1µF, 20%, 250V, polyester 2508881049

C558 470pF, 10%, 500V, ceramic 2602320845

PARTS OF CHASSIS

MISCELLANEOUS

Ref. Description

Part. No.

micro connector 2 pole	1813930150
micro connector 8 pole	1814521282
socket 5 pole	1814521053
micro connector 10 pole	1814521446
connector 4 pole (dia 1.5)	1814521348
connector 4 pole (dia 2.35)	1814521052
Ref. Description	Part. No.
Capacitors	
C171 47µF, 160V, electrolytic	2701741025
C172 10µF, 160V, electrolytic	2796331000
C173 470µF, 35V, electrolytic	2701741019
C174 470µF, 25V, electrolytic	2701741018
C175 10µF, 25V, electrolytic	2796331000
C301 47µF, 16V, electrolytic	2701741016
C302 47µF, 16V, electrolytic	2701741016
C303 47µF, 16V, electrolytic	2701741016
C311 100µF, 16V, electrolytic	2701741029
C312 0.010µF, 10%, 50V, ceramic	2508331038
C313 0.010µF, 10%, 50V, ceramic	2508331038
C314 47µF, 16V, elecltrolytic	2701741016
C315 0.010µF, 10%, 50V, ceramic	2508331038
C316 47µF, 16V, electrolytic	2701741016
C317 0.010µF, 10%, 50V, ceramic	2508331038
C318 47µF, 16V, electrolytic	2701741016
C319 10µF, 16V, electrolytic	2701741028
C320 0.0010µF, 10%, 50V, ceramic	2508281029
C321 0.022µF, 20%, 50V, ceramic	2508332238
C326 4.7µF, 25V, electrolytic	2701741020
C331 0.010µF, 10%, 50V, ceramic	2508331038
C332 0.010µF, 10%, 50V, ceramic	2508331038
C333 0.010µF, 10%, 50V, ceramic	2508331038
C334 0.010µF, 10%, 50V, ceramic	2508331038
C335 0.010µF, 10%, 50V, ceramic	2508331038
C336 0.010µF, 10%, 50V, ceramic	2508331038
C337 0.010µF, 10%, 50V, ceramic	2508331038
C338 2.2µF, 63V, electrolytic	2791202297
C341 2.2µF, 63V, electrolytic	2791202297
C343 2.2µF, 63V, electrolytic	2791202297
C352 0.010µF, 10%, 50V, ceramic	2508331038
C353 100µF, 16V, electrolytic	2701741029
C361 56pF, 5%, 50V, ceramic	2508415605
C362 82pF, 5%, 50V, ceramic	2509040815
C364 33pF, 5%, 50V, ceramic	2602320545
C365 33pF, 5%, 50V, ceramic	2602320545
C366 33pF, 5%, 50V, ceramic	2602320545
C367 5.1pF, 10%, 500V, ceramic	2509041403
C368 5.1pF, 10%, 500V, ceramic	2509041403
C369 5.1pF, 10%, 500V, ceramic	2509041403

9CM062/9CM082 REPLACEMENT PARTS LIST (Continued)

Ref.	Description	Part. No.	
Resistors			
(All are 5%, 0.2W metal film unless otherwise specified)			
R175	1kΩ, 0.33W	2302861022	2302822235
R301	75Ω	2394027505	2394041055
R302	75Ω	2394027505	2302861022
R303	75Ω	2394027505	2302124715
R304	10kΩ	2394011035	2302861022
R305	10kΩ	2394011035	2302124715
R306	10kΩ	2394011035	2394051215
R307	10kΩ	2394011035	2291070003
R308	10kΩ	2394011035	2302821035
R309	10kΩ	2394011035	2302123922
R311	330Ω	2302123315	2204291273
R312	330Ω	2302123315	2390990028
R313	330Ω	2302123315	2302890466
R314	22kΩ, 0.33W	2302822235	2394041325
R315	82kΩ, 0.33W	2394038235	2394061815
R317	15kΩ, 0.33W	2302821535	2302122225
R318	15kΩ, 0.33W	2302821535	2394031335
R319	9.1kΩ, 0.33W	2394049125	2204692222
S R320	4.7Ω	2302684785	2302126815
R321	6.8kΩ, 0.33W	2302126825	2302823325
R322	10kΩ, potm	2291070004	2302822235
R323	10kΩ, 0.33W	2302821035	2394262215
R324	15kΩ, 0.33W	2302821535	2302684785
R325	1kΩ, 0.33W	2302861022	2394061025
R326	15kΩ, 0.33W	2302821535	2499090002
R327	1.2kΩ	2302041225	2302122025
R328	1kΩ, potm	2204291267	2302126805
R329	1.2kΩ	2392041225	2499090002
R331	1.2kΩ	2392041225	2302122025
R332	1kΩ, potm	2204291267	2302122025
R333	1.2kΩ	2392041225	2394041045
R334	1.2kΩ	2392041225	2394041025
R335	1kΩ, potm	2204291267	2302122735
R336	1.2kΩ	2392041225	2394041045
R337	470kΩ, 0.33W	2302124745	2302861022
R338	430Ω	2394024315	2302861022
R339	82kΩ	2394028235	2302681585
R341	430Ω	2394024315	2291070002
R342	82kΩ	2394028235	2392058205
R343	430Ω	2394024315	2302681015
R344	82kΩ	2394028235	2390990029
R345	10Ω	2394011005	2390990030
R346	10Ω	2394011005	2390990031
R347	10Ω	2394011005	2302121015
R348	330Ω, 0.33W	2303203315	2394041045
R349	330Ω, 0.33W	2303203315	2394041045
R351	330Ω, 0.33W	2303203315	2303201005
S R352	4.7Ω	2302684785	2203874722
R353	47Ω	2392044705	2394044795
R354	47Ω	2392044705	2394024325
R355	47Ω	2392044705	2204291268
R356	22kΩ, 0.33W	2302822235	2394026845
R357	56Ω	2394045605	2204291268
R358	56Ω	2394045605	2302861273
R359	56Ω	2394045605	2394041545
R361	68Ω	2394026805	2291010104
R362	68Ω	2394026805	2302125645
R364	33Ω	2392043305	2204291269
R365	33Ω	2392043305	2302125645
R366	33Ω	2392043305	2204291269

9CM062/9CM082 REPLACEMENT PARTS LIST (Continued)

Ref.	Description	Part. No.	Ref.	Description	Part. No.
Resistors (continued)			Diodes		
R517	56kΩ, 0.33W	2303205635	D326	diode	5301811001
S R518	2.2Ω	2302682285	D327	diode	5301811001
R519	4.7kΩ, 0.33W	2302124725	D353	diode	5301811001
R521	1.8kΩ, 0.33W	2302121825	D354	diode	5301811001
R522	150Ω, 1W	2302931515	D355	diode	5301811001
R524	10kΩ, potm	2291070003	D368	diode	5301811001
R525	3.9kΩ, 0.33W	2302123922	D407	zener diode 5.1V	5302390242
R526	150Ω, 1W	2302931515	D424	diode	5301811001
R528	2.2Ω, 0.33W	2392042295	D426	diode	5301711002
R529	330Ω, 0.5W	2303203315	D427	diode	5391500200
R531	4.7kΩ, 0.33W	2302124725	D431	diode	5302261002
R532	1.8kΩ, 0.33W	2302121825	D432	diode	5302390244
R533	120Ω, 0.33W	2302121215	D438	diode	5391510050
S R534	47kΩ, 0.33W	2302124735	D445	diode	5302681002
R535	10kΩ, 0.33W	2302821035	D447	zener diode 18V	5302250180
R536	2.2kΩ, 0.33W	2302122225	D505	diode	5301811001
R537	4.7kΩ, 0.33W	2302124725	D506	diode	5301811001
R538	15kΩ, 0.33W	2302821535	D519	diode	5301711002
R539	10kΩ, potm	2204291270	D528	diode	5301711002
R541	10kΩ, potm	2291010086	D534	diode	5301711002
Resistors		Part. No.	D539	zener diode 2.4V	5390140249
			D553	diode	5301711002
			D554	diode	5302681002
			D556	diode	5391500450
			D557	zener diode 51V	5390255109
Resistors		Part. No.	Transistors		Part. No.
R542	4.7kΩ, 0.33W	2302124725	TS311	NPN, driver	6103700001
R543	270kΩ, 0.33W	2394032745	TS312	NPN, driver	6103700001
R544	1.2kΩ, 0.33W	2302121225	TS313	NPN, driver	6103700001
R545	100kΩ, 0.33W	2394041045	TS317	PNP, driver	6103720002
R546	1MΩ, 0.33W	2394041055	TS345	NPN, driver	6190004470
R547	560kΩ, 0.33W	2302125645	TS346	NPN, driver	6190004470
R548	2.7kΩ, 0.33W	2302822725	TS347	NPN, driver	6190004470
S R549	2.7Ω	2302890464	TS353	NPN, output	6190102330
R551	22kΩ, 0.33W	2302822235	TS354	NPN, output	6190102330
R552	4.7kΩ, 0.33W	2302124725	TS355	NPN, output	6190102330
R553	5.6kΩ, 0.5W	2302225625	TS356	NPN, driver	6104350002
R554	8.2kΩ, 0.5W	2302128225	TS425	NPN, driver	6105350003
R555	47kΩ, 0.33W	2302124735	TS428	NPN, output	6104400109
S R556	1.5Ω	2302681585	TS436	NPN, driver	6105000004
R557	56kΩ, 0.33W	2302205635	TS447	NPN, driver	6103700001
R558	47kΩ, potm	2291070006	TS448	PNP, driver	610372C002
R559	68kΩ, 0.33W	2302826835	TS501	NPN, driver	6104350002
R562	10MΩ, 0.33W	2302121065	TS502	NPN, driver	6104350002
R563	4.7MΩ, 0.33W	2302124755	TS521	PNP, output	6190101480
S R564	1.2Ω, 1W	2394051295	TS524	NPN, output	6103680002
R566	1kΩ, 0.33W	2302861022	TS536	PNP, driver	6190102320
R567	47kΩ, potm	2291010048	TS537	PNP, driver	6190102320
Coils and transformers		Part. No.	TS538	NPN, output	6104350002
S319	coil 6.8μH	3618136899	TS545	PNP, driver	6103720002
S T401	hor. drive transf	3091000218	TS546	NPN, output	6190005570
S T402	line outp. transf	2290000032	TS551	NPN, output	6105350003
S427	coil 5μH	3618271774			
S432	linearity coil	3691150001			
S434	coil 200μH	3618271770			
S436	coil 12mH	3618271771			

9CM062/9CM082 REPLACEMENT PARTS LIST (Continued)

Ref.	Description	Part. No.	Ref.	Description	Part. No.
Integrated circuits			Resistors		
IC102	Voltage stabilizer	6192140331	R103	2.2Ω. 7W. 10%	2401440096
IC301	RGB interface	6123300516	R104	10Ω. dual ptc	2302890465
IC401	Exclusive OR	6123300517	R111	47kΩ. 0.33W	2302124735
IC402	Multivibrator	6123300426	R112	47kΩ. 0.5W	2302124735
IC403	Horizontal sync.	6123300518	R113	3kΩ. 0.5W	2303223025
IC501	Vertical sync.	6123300423	R114	1kΩ. potm	2204291267
PARTS OF POWER SUPPLY			R115	4.3kΩ. 0.5W	2392044325
Ref.	Description	Part. No.	R116	4.3kΩ. 0.5W	2392044325
Miscellaneous			R117	390Ω. 0.5W	2394163915
	Power supply complete	7044251878	R119	9.1kΩ. 0.5W	2394049215
	Power switch	1606780548	R121	110kΩ. 0.5W	2392041145
	Power socket	1813930250	R122	120Ω. 0.33W	2302121215
	Connector 2 pole	1814521280	R125	270Ω. 0.33W	2302122715
	Connector 5 pole	1814521053	R126	18Ω. 0.33W	2392041895
S VL101	Fuse 3A/250V	1813900214	R127	3.9kΩ. 0.33W	2302123922
Ref. Description			R128	3.9kΩ. 0.33W	2302123922
Capacitors			S R129	30Ω. 1W	2394053005
S C102	0.22μF. 20%. 250V. polyester	2602320841	R133	22kΩ. 5W	2302890472
S C103	0.0022μF. 125V. ceramic	2598230002	R136	18Ω. 0.5W	2392041895
S C104	0.0022μF. 125V. ceramic	2598230002	S R137	33Ω. 1W	2394053305
C106	0.047μF. 20%. 400V. polyester	2509041325	R146	100kΩ. 0.5W	2394041045
C107	0.0022μF. 10%. 1KV. ceramic	2509041035	R152	1kΩ. 0.33W	2302861022
C108	0.0022μF. 10%. 1KV. ceramic	2509041035	Ref. Description		
C109	0.0022μF. 10%. 1KV. ceramic	2509041035	Coils and transformers		
C110	0.0022μF. 10%. 1KV. ceramic	2509041035	S T101	mains transformer	3091000269
C111	0.22μF. 10%. 250V. polyester	2602320543	S S102	line choke ac	3693400009
C112	220μF. 200V. electrolytic	2701392220	S131	coil 10μH	3618271360
C116	47μF. 16V. electrolytic	2701741016	S136	coil 2μH	5699000032
C117	0.010μF. 20%. 50V. ceramic	2602320530	S141	coil 180μH	3618271580
C122	1μF. 50V. electrolytic	2701741015	S142	coil 180μH	3618271580
C124	0.013μF. 5%, 100V. polyester	2602320834	S143	coil 100μH	3618271361
C129	0.33μF. 10%. 63V. polyester	2508143349	S144	coil 100μH	3618271361
C132	0.0047μF. 10%. 630V. polyester	2509040712	Ref. Description		
C133	0.047μF. 20%. 400V. polyester	2509041325	Coils and transformers		
C141	220pF. 10%. 500V. ceramic	2602320546	S T101	mains transformer	3091000269
C142	220pF. 10%. 500V. ceramic	2602320546	S S102	line choke ac	3693400009
C143	220pF. 10%. 500V. ceramic	2602320546	S131	coil 10μH	3618271360
C144	220pF. 10%. 500V. ceramic	2602320546	S136	coil 2μH	5699000032
C145	47μF. 160V. electrolytic	2701741025	S141	coil 180μH	3618271580
C146	100μF. 100V. electrolytic	2791261017	S142	coil 180μH	3618271580
C147	470μF. 35V. electrolytic	2701741019	S143	coil 100μH	3618271361
C148	470μF. 25V. electrolytic	2701741018	S144	coil 100μH	3618271361
C152	0.022μF. 5%. 400V. polyester	2509582239	Ref. Description		

9CM062/9CM082 REPLACEMENT PARTS LIST (Continued)

Ref.	Description	Part. No.	Ref.	Description	Part. No.
Diodes			Capacitors		
D107	diode	5302551001	C701	0.010μF. 10%, 50V. ceramic	2508331038
D108	diode	5302551001	C702	47μF. 16V. electrolytic	2701741016
D109	diode	5302551001	C703	10μF. 160V. electrolytic	2796331000
D110	diode	5302551001	C705	0.010μF. 20%, 500V. ceramic	2509040919
D111	zener diode 24V	5302250240	C706	10μF. 160V. electrolytic	2796331000
D112	diode	5301811001	C707	0.010μF. 20%, 500V. ceramic	2509040919
D115	zener diode 6.2V	5301570629	C708	10μF. 160V. electrolytic	2796331000
D121	diode	5301811001	C709	0.010μF. 20%, 500V. ceramic	2509040919
D125	diode	5301811001	C711	10μF. 160V. electrolytic	2796331000
D126	diode	5301811001	C718	0.010μF. 20%, 500V. ceramic	2509040919
D127	diode	5301811001	C719	0.010μF. 20%, 500V. ceramic	2509040919
D128	zener diode 9.1V	5301990919	C720	0.010μF. 20%, 500V. ceramic	2509040919
D129	zener diode 2.4V	5390140249	C722	0.47μF. 10%. 100V. polyester	2508144749
D131	diode	5301811001	C726	470pF. 10%. 500V. ceramic	2602320845
D133	diode	5391500200	C728	0.47μF. 20%, 100V. polyester	2508144749
D136	diode	5391500200	C733	470pF. 10%. 500V. ceramic	2602320845
D137	diode	5391500430	C735	0.47μF. 20%, 100V. polyester	2508144749
D141	diode	5391500200	C739	470pF. 10%. 500V. ceramic	2602320845
D142	diode	5391500200	C741	0.010μF. 20%. 500V. ceramic	2509040919
D143	diode	5391500200	C742	22μF. 160V. electrolytic	2790332207
D144	diode	5391500200	C743	0.0022μF. 10%. 500V. ceramic	2598280004
D152	zener diode 16V	5390990690	C744	0.0022μF. 10%. 500V. ceramic	2598280004
D165	diode	5301811001	C745	0.0033μF. 500V. ceramic	2598280005
			C746	470pF. 10%. 2KV. ceramic	2602320547
			C751	39pF. 5%. 50V. ceramic	2509040928
			C752	39pF. 5%. 50V. ceramic	2509040928
			C753	39pF. 5%. 50V. ceramic	2509040928
Ref.	Description	Part. No.			
Transistors and Integrated Circuits					
IC101	Photo coupler	5392900120			
TS117	NPN. error latch	6105000004			
TS121	NPN. pulse width regulator	6190004040			
TS132	NPN. switch	6190005560			
TS152	Thyristor	6191400010			

PARTS OF PICTURE TUBE PANEL

Ref.	Description	Part. No.
Miscellaneous		
	Picture tube panel complete	7092500210
	Connector 1 pole	1814521279
	Micro connector 8 pole	1814521282
	Connector 6 pole	1814521281
	CRT socket	5490400043
	Connector 1 pole	1814521445
S SG701	spark gap	1895000003
S SG702	spark gap	1895000003
S SG703	spark gap	1895000003

9CM062/9CM082 REPLACEMENT PARTS LIST (Continued)

Ref.	Description	Part. No.	Ref.	Description	Part. No.		
Resistors							
(all are 5% metal film unless otherwise specified)			Coils				
R701 680Ω, 0.33W	2302126815	S706	coil 2.2μH	3618272028			
S R702 2.2Ω	2302682285	S711	coil 2.2μH	3618272028			
S R703 2.2Ω	2302682285	S715	coil 2.2μH	3618272028			
S R704 2.2Ω	2302682285	S742	coil 7.5μH	3290000013			
S R705 1kΩ, 3W	2394071025						
R707 10Ω, 0.2W	2394011005						
R708 33Ω, 0.2W	2392043305						
S R709 1kΩ, 3W	2394071025	Diodes					
R712 10Ω, 0.2W	2394011005	D701	zener diode 8.2V	5302390245			
R713 33Ω, 0.2W	2392043305	D706	diode	5301811001			
S R714 1kΩ, 3W	2394071025	D708	diode	5301711002			
R716 10Ω, 0.2W	2394011005	D709	diode	5301711002			
R717 43Ω, 0.2W	2394024305	D711	diode	5301811001			
R722 220Ω, 0.5W	2394042215	D715	diode	5301811001			
R723 330kΩ, 0.2W	2302123342	D722	diode	5302681002			
R724 100kΩ, 0.2W	2394041045	D723	diode	5302681002			
R725 22kΩ, 0.2W	2394042235	D728	diode	5302681002			
R726 100kΩ, potm	2204291272	D729	diode	5302681002			
R727 300kΩ, 0.2W	2302123042	D735	diode	5302681002			
R728 220Ω, 0.5W	2394042215	D736	diode	5302681002			
R729 330kΩ, 0.2W	2302123342	D742	diode	5302681002			
R731 100kΩ, 0.2W	2394041045						
R732 22kΩ, 0.2W	2394042235						
R733 100kΩ, potm	2204291272						
R734 300kΩ, 0.2W	2302123042	Transistors					
R735 220Ω, 0.5W	2394042215	TS705	NPN, output	6104150001			
R736 330kΩ, 0.2W	2302123342	TS706	PNP, output	5302390241			
R737 100kΩ, 0.2W	2394041045	TS707	PNP, driver	5302390253			
R738 22kΩ, 0.2W	2394042235	TS709	NPN, output	6104150001			
R739 100kΩ, potm	2204291272	TS711	PNP, output	5302390241			
R741 300kΩ, 0.2W	2302123042	TS712	PNP, driver	5302390253			
R742 1.5kΩ, 0.5W	2394041525	TS714	NPN, output	6104150001			
R743 15kΩ, 0.5W	2394041535	TS715	PNP, output	5302390241			
R751 8.2Ω, 0.5W	2392048295	TS716	PNP, driver	5302390253			
R752 8.2Ω, 0.5W	2392048295	TS722	PNP, driver	5302390241			
R753 8.2Ω, 0.5W	2392048295	TS735	PNP, driver	5302390241			

WARNING

Critical components having special safety characteristics are identified with an S by the Ref. No. in the parts list and enclosed within a broken line* along with the safety symbol ▲ on the schematics or exploded views.

Use of substitute replacement parts which do not have the same specified safety characteristics may create shock, fire, or other hazards.

Under no circumstances should the original design be modified or altered without written permission from the N.A.P. Consumer Electronics Corp. NAPCEC assumes no liability, express or implied, arising out of any unauthorized modification of design. Servicer assumes all liability.

*Broken line: — • — • — • — •

NAPCEC SAFETY GUIDELINES FOR THE PROFESSIONAL SERVICE TECHNICIAN

Safety Checks

After the original service problem has been corrected, a complete safety check should be made. Be sure to check over the entire set, not just the areas where you have worked. Some previous servicer may have left an unsafe condition, which could be unknowingly passed on to your customer. Be sure to check all of the following:

Fire and Shock Hazard

1. Be sure all components are positioned in such a way as to avoid the possibility of adjacent component shorts. This is especially important on those chassis which are transported to and from the service shop.
2. Never release a repaired receiver unless all protective devices such as insulators, barriers, covers, strain reliefs, and other hardware have been installed according to the original design.
3. Soldering and wiring must be inspected to locate possible cold solder joints, solder splashes, sharp solder points, frayed leads, pinched leads, or damaged insulation (including ac cord). Be certain to remove loose solder balls and all other loose foreign particles.
4. Check across-the-line components and other components for physical evidence of damage or deterioration and replace if necessary. Follow original layout, lead length and dress.
5. No lead or component should touch a receiving tube or a resistor rated at 1 watt or more. Lead tension around protruding metal surfaces or edges must be avoided.
6. Critical components having special safety characteristics are identified with an S by the Ref. No. in the parts list and enclosed within a broken line* along with the safety symbol ▲ on the schematics. Replacement parts without the same safety characteristics may create shock, fire or other hazards.
7. When servicing any receiver, always use a separate isolation transformer for the chassis. Failure to use a separate isolation transformer may expose you to possible shock hazard, and may cause damage to servicing instruments.
8. Many receivers use a polarized line cord (one wide pin on the plug). Defeating this safety

device may create a potential hazard to the servicer and the user. Extension cords which do not incorporate the polarizing feature should never be used.

9. After re-assembly of the set, always perform an ac leakage test or resistance test from the line cord to all exposed metal parts of the cabinet. Also, check all metal control shafts (with knobs removed), antenna terminals, handles, screws, etc. to be sure the set is safe to operate without danger of electrical shock.

*Broken line: ____ . ____ . ____ . ____ .

Implosion

1. All picture tubes used in current model receivers are equipped with an integral implosion system. Care should always be used, and safety glasses worn, whenever handling any picture tube. Avoid scratching or otherwise damaging the picture tube during installation.
2. Use only replacement tubes as specified by the manufacturer.

X-radiation

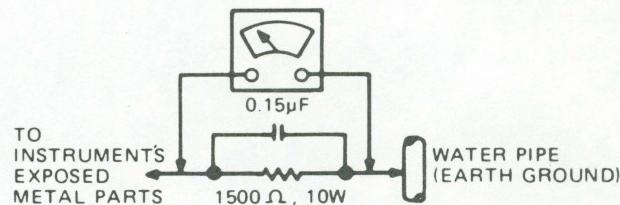
1. Be sure procedures and instructions to all your service personnel cover the subject of X-radiation. Potential sources of X-rays in TV receivers are the picture tube and the high voltage circuits. The basic precaution which must be exercised is to keep the HV at the factory recommended level.
2. To avoid possible exposure to X-radiation and electrical shock, only the manufacturer's specified anode connectors must be used.
3. It is essential that the service technician has available at all times an accurate HV meter. The calibration of this meter should be checked periodically against a reference standard.
4. When the HV circuitry is operating properly there is no possibility of an X-radiation problem. High voltage should always be kept at the manufacturer's rated value—no higher—for optimum performance. Every time a color set is serviced, the brightness should be run up and down while monitoring the HV with a meter to be certain that the HV does not exceed the

specified value and that it is regulated correctly. We suggest that you and your service technicians review test procedures so that HV and HV regulation are always checked as a standard servicing procedure, and the reason for this prudent routine be clearly understood by everyone. It is important to use an accurate and reliable HV meter. It is recommended that the HV reading be recorded on each customers' invoice, which will demonstrate a proper concern for the customers' safety.

5. When troubleshooting and making test measurements in a receiver with a problem of excessive high voltage, reduce the line voltage by means of a Variac to bring the HV into acceptable limits while troubleshooting. Do not operate the chassis longer than necessary to locate the cause of the excessive HV.
6. New type picture tubes are specifically designed to withstand higher operating voltages without creating undesirable X-radiation. It is strongly recommended that any shop test fixture which is to be used with the new higher voltage chassis be equipped with one of the new type tubes designed for this service. Addition of a permanently connected HV meter to the shop test fixture is advisable. The CRT types used in these new sets should never be replaced with any other types, as this may result in excessive X-radiation.
7. It is essential to use the specified picture tube to avoid a possible X-radiation problem.
8. Most TV receivers contain some type of emergency "Hold Down" circuit to prevent HV from rising to excessive levels in the presence of a failure mode. These various circuits should be understood by all technicians servicing them, especially since many hold down circuits are inoperative as long as the receiver performs normally.

Leakage Current Cold Check

1. Unplug the ac line cord and connect a jumper between the two prongs of the plug.
2. Turn on the power switch.
3. Measure the resistance value between the jumpered ac plug and all exposed cabinet parts of the receiver, such as screw heads, antennas and control shafts. When the exposed metallic part has a return path to the chassis, the reading should be between 1 megohm and 5.2 megohms. When the exposed metal does not have a return path to the chassis, the reading must be infinity. Remove the jumper from the ac line cord.



Leakage Current Hot Check

1. Do not use an isolation transformer for this test. Plug the completely re-assembled receiver directly into the ac outlet.
2. Connect a 1.5k ohm, 10 watt resistor paralleled by a 0.15μF. capacitor between each exposed metallic cabinet part and a good earth ground such as a water pipe, as shown above.
3. Use an ac voltmeter with at least 5000 ohms/volt sensitivity to measure the potential across the resistor.
4. The potential at any point should not exceed 0.75 volts. A leakage current tester may be used to make this test; leakage current must not exceed 0.5 millamps. If a measurement is outside the limits specified, there is a possibility of shock hazard. The receiver should be repaired and re-checked before returning it to the customer.
5. Repeat the above procedure with the ac plug reversed. (Note: An ac adapter is necessary when a polarized plug is used. Do not defeat the polarizing feature of the plug.)

Picture Tube Replacement

The primary source of X-radiation in this television is the picture tube. The picture tube utilized in this chassis is specially constructed to limit X-radiation emissions. For continued X-radiation protection, the replacement tube must be the same type as the original, including suffix letter, or an N.A.P. Consumer Electronics Corp. (NAPCEC) approved type.

Parts Replacement

Many electrical and mechanical parts in NAPCEC television sets have special safety-related characteristics. These characteristics are often not evident from visual inspection nor can the protection afforded by them necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. The use of a substitute part which does not have the same safety characteristics as the NAPCEC recommended replacement part shown in this service manual may create shock, fire or other hazards.



Computer Systems Division
1200 Wilson Drive
West Chester, PA 19380